

## On-Site Self Regenerative Water Softeners and Recycled Water

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Over the past forty years, the salt content of wastewater has become a topic of concern to water and wastewater agencies; high salinity degrades water quality, and thus, impacts residential, commercial, industrial, and agricultural water users. High salinity levels can also negatively impact groundwater, wastewater, and recycled water resources, and utility distribution systems.

In the last few decades increasing numbers of California residents have installed water softeners in their homes to reduce problems caused by hard water (water high in calcium/magnesium salts.) While not a health concern, hard water can result in the formation of spots on dishes or vehicles, scaling of pipe walls and plumbing fixtures, and slightly higher soap requirements for laundry and dish washing. Salts are present in potable water, primarily from natural sources but also from discharges of agricultural, industrial, and municipal discharges into rivers. Unfortunately, the use of softeners, particularly onsite, self-regenerative water softeners,

has led to increased salt in recycled water. Water softeners, through a cation exchange media, soften the water by exchanging the calcium and magnesium ions for sodium and potassium.



Any salt added to wastewater can push recycled water agencies using traditional water recycling treatment processes into non-compliance with their water quality permits and or make the recycled water unmarketable for irrigation use, the primary use throughout the State. In many cases, the potable water is already high in total dissolved solids (TDS), and water softeners compound the problem, creating difficulties attracting customers for the

higher saline recycled water. Salinity or TDS is the concentration of mineral salts dissolved in water. Sodium reduces soil moisture penetration, TDS reduces crop yields, and high level of chloride is toxic to plants. The discharge of salts (i.e. calcium, magnesium, sodium, sulfate, and chloride) creates problems for the environment. Furthermore, salts are difficult to remove using traditional treatment processes.

For this reason, concerned agencies have looked to source control as a method of dealing with salts. Residential self-regenerating water softeners (SRW softeners) — also known as automatic water softeners, rock salt water softeners, or “ion exchange” water softeners — are an easily identifiable and preventable source of salt because they use sodium chloride (rock salt) to regenerate the exchange capacity of the resin. After this regeneration the salt is discharged and

results in excessive amounts of salt ending up in the waste stream.

To deal with the problem in California, several recycled water producers banned SRW softeners. Irvine Ranch Water District placed a ban in 1966. Then the State Health and Safety Code added technical standards for SRW softeners in the 1970s. In 1978, a state law (SB 2148, 1978) prohibited local bans on residential water softeners; even still, some local jurisdictions banned them. Some of these bans were challenged and overturned in court in 1992. Then in 1996 and 1997, the Court of Appeals upheld lower court rulings that local ordinances banning water

softeners are invalid because of the existing State statutes that forestalled new local water softener standards or regulations. To further restrict on-site residential water softeners, local agencies would have to change existing State statutes. In response, IRWD and the Association of California Water Agencies sponsored Senate Bill 1006

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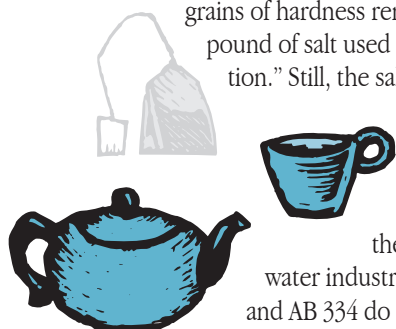


**Left to Right:** Timer Water Softener. This outdated water softener is regenerated based on a set time interval. Demand Initiated Water Softener. This newer more water efficient water softener senses when regeneration is necessary.

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(Costa, 1999) which amended SB 2148 to set a framework for the restriction of self-regenerative water softeners. Then in 2003, Assembly Bill 334 -Water Softening and Conditioning Appliances - amended SB 1006 to allow local agencies flexibility improve recycled water quality through source control measures.

The water softener industry met the challenge by designing new water softeners which meet the criteria "An appliance installed on or after January 1, 2002, shall be certified by a third party rating organization using industry standard to have a salt efficiency rating of no less than 4,000 grains of hardness removed per pound of salt used in regeneration." Still, the salt generated from water softeners continues to challenge the recycled water industry. SB 1006 and AB 334 do not apply to existing water softeners produced and installed prior to the adoption of any ordinance. The appliances are grandfathered in and can operate as usual. Also, even the most efficient water softener system still requires a regular discharge of salt brine into local wastewater stream. Although some headway has been made, alternative strategies are still needed.



One local agency, Monterey Regional Water Pollution Control Agency supplies recycled water to irrigate almost 12,000 acres of food crops. Although the five year Monterey Wastewater Reclamation Study for Agriculture did not see a decrease in soil health or crop yields, the long term effects of recycled water's salt content is a major concern to growers. As a result of growers' concerns, MRWPCA has examined the recycled water quality and found that sodium levels were nearing the upper limits of the acceptable range. MRWPCA found that 37 percent of the source-water's salt load was from residential, commercial and industrial water softener brine.

The State has also addressed the issue of salt from SRW softeners. The Recycled Water Task Force (RWTF) report recommended to the State legislature that local agencies be empowered through legislation to regulate the discharge of residential water softeners in the same manner as other sources of discharge into sewers and encouraged water softener studies to develop alternatives for salt reduction in recycled water. Another RWTF recommendation asked local agencies to educate consumers regarding the impacts of SRW softeners through publicity campaigns and to offer financial incentives to upgrade older inefficient appliances. Assembly Bill 334 (Goldberg, 2003) Water Softening and Conditioning Appliances was adopted in

response to the RWTF recommendations.

The State has supported further efforts to reduce salt loading when the California Department of Water Resources awarded Santa Clara Valley Water District with a



2002 Proposition 13 Grant for their Pilot Water Softener Rebate Program. This award winning pilot program provided 400 residents with a rebate of \$150 for the replacement of their inefficient pre-1999 water softener system. The newer models, demand-initiated regeneration water softeners, more efficiently sense when the resin must be recharged with salt and regenerate the resin as needed. Thus, these types of water softeners use less water and less salt.



## Water Hardness is defined in SB 1006 as

*"the total of all dissolved calcium, magnesium, iron and other heavy metals, that interact with soaps and detergents in a manner that the efficiency of soaps and detergents for cleaning purposes is impaired. Harness is expressed in grains per gallon or milligram per liter as if all such salts were present as calcium carbonate."*